

REMARKS

This paper is responsive to a Non-Final Office action dated January 10, 2008. Claims 2, 4-8, 10-19, 23, 46, and 55-57 were examined.

Claim Rejections Under 35 U.S.C. § 112

Claims 23, 55, and 57 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Claim 23 is amended to clarify claim language. Applicants respectfully maintain that claims 23, 55, and 57 satisfy the requirements of 35 U.S.C. § 112, second paragraph. Accordingly, Applicants respectfully request that the rejection of claims 23, 55, and 57 be withdrawn.

Claim Rejections Under 35 U.S.C. § 102

Claims 2, 7, 23, 46, and 56 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,959,522 to Andrews (hereinafter, "Andrews"). Regarding claim 23, Applicants respectfully maintain that Andrews, alone or in combination with other references of record, fails to teach or suggest that

the plurality of electrically conductive links are electrically coupled to the electrically conductive enclosure and are electrically coupled to each other at a first location within the aperture, and that individual ones of the plurality of electrically conductive links are coupled to each other at least at a second location within the aperture by the at least one additional electrically conductive link, the at least one additional electrically conductive link being within the aperture,

as required by amended claim 23. Andrews teaches that

[w]hen lower shielding layer 142 is conductive, the flux concentration induces eddy currents that circulate in lower shielding layer 142 in a direction opposite to that of the applied current flowing along conduction path 140. The eddy currents also induce an opposing magnetic flux which is coupled from lower shielding layer 142 to conduction path 140 to reduce the effective inductance of inductor 112. To reduce these eddy currents, lower shielding layer 142 is patterned with openings 156 running perpendicular to the direction of applied current to interrupt the current paths of the eddy currents. In the embodiment shown in FIG. 2, where conduction path 140 is formed as a circular spiral, openings 156 project radially from the axis of conduction path 140 so as to be perpendicular to the windings of conduction path 140. Such patterning can produce as much as an eightfold increase in the effective inductance as compared with prior art inductors using an unpatterned lower shielding layer. Openings 156 have an additional benefit of reducing the area of lower shielding layer 142, which reduces the parasitic substrate capacitance of inductor 112 and increases its maximum operating frequency.

A core region 160 of lower shielding layer 142 forms a high permeability hub centered on the axis of conduction path 140 to further concentrate the magnetic flux. The absence of inner windings of conduction path 140 reduces the need to curtail eddy currents in core region 160, which consequently is formed as a continuous region of high permeability material. Therefore, the radial projections of lower shielding layer 142 can be coupled to core region 160 and to a power supply conductor 175 operating at ground potential to shield substrate 130 from electric fields produced by voltage swings of inductor 112. Such electric field shielding provides more consistent control over the operation of inductor 112 and prevents dissipative resistive currents in substrate 130 that reduce the effective Q of inductor 112 and inject noise into nearby circuitry. When inductor 112 experiences large voltage swings, especially at high frequencies above 1.0 gigahertz, electrical shielding is improved by using an annular ring 158 to establish a constant potential throughout lower shielding layer 142.

Col. 3, line 42-col. 4, line 15. Annular ring 158 and the radial projections of lower shielding layer 142 of Andrews form openings 156. Col. 3, line 18-col. 4, line 15; Fig. 2. Nowhere does Andrews teach or suggest individual ones of a plurality of electrically conductive links that are coupled to each other at least at a second location within the aperture by at least one additional electrically conductive link, the at least one additional electrically conductive link being within the aperture, as required by amended claim 23. Since Andrews fails to teach or suggest the recited limitation and no other art of record adds the missing disclosure, Applicants respectfully request that the rejection of claim 23 and all claims dependent thereon, be withdrawn.

Claim 56 is amended to clarify claim language. Regarding claim 56, the Office action fails to point out where Andrews teaches or suggests, and Applicants respectfully maintain that Andrews, alone or in combination with other references of record, fails to teach or suggest that

individual ones of the plurality of electrically conductive links are coupled to each other at least at a second location within the aperture by the at least one additional electrically conductive link, the at least one additional electrically conductive link being within the aperture, the at least one additional electrically conductive link intersecting individual ones of the plurality of electrically conductive links at ninety degree angles,

as required by amended claim 56. Annular ring 158 and the radial projections of lower shielding layer 142 of Andrews form openings 156. Col. 3, line 18-col. 4, line 15; Fig. 2. Assuming *arguendo* that openings 156 are similar to the aperture of claim 56, nowhere does Andrews teach or suggest that individual ones of the plurality of electrically conductive links are coupled to each other at least at a second location within the aperture by the at least one additional electrically conductive link, the at least one additional electrically conductive link being within the aperture, the at least one additional electrically conductive link intersecting individual ones of the plurality of electrically conductive links at ninety degree angles, as required by amended claim 56. Since Andrews fails to teach or suggest the recited limitation and no other art of record adds the missing disclosure, Applicants respectfully request that the rejection of claim 56 and all claims dependent thereon, be withdrawn.

Claim Rejections Under 35 U.S.C. § 103 Over Andrews

Claims 4-6 and 55 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Andrews. Regarding claims 4-6 and 55, Applicants respectfully maintain that Andrews, alone or in combination with other references of record, fails to teach or suggest that

the plurality of electrically conductive links are electrically coupled to the electrically conductive enclosure and are electrically coupled to each other at a first location within the aperture, and individual ones of the plurality of electrically conductive links are coupled to each other at least at a second location within the aperture by the at least one additional electrically conductive link, the at least one additional electrically conductive link being within the aperture,

as required by amended claim 23, from which claims 4-6 and 55 depend. As discussed above with regard to claim 23, Andrews fails to teach or suggest those limitations of claim 23. Since Andrews fails to teach or suggest the recited limitations and no other art of record adds the missing disclosure, Applicants respectfully request that the rejection of claims 4-6 and 55 be withdrawn.

Claim Rejections Under 35 U.S.C. § 103 Over Andrews and Gomez

Claims 8 and 10-19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Andrews in view of U.S. Patent No. 6,847,282 to Gomez et al. (hereinafter, "Gomez"). Regarding claims 8, 10-12, 15, 17-19, Applicants respectfully maintain that Andrews, alone or in combination with Gomez or other references of record, fails to teach or suggest

the plurality of electrically conductive links are electrically coupled to the electrically conductive enclosure and are electrically coupled to each other at a first location within the aperture, and that individual ones of the plurality of electrically conductive links are coupled to each other at least at a second location within the aperture by the at least one additional electrically conductive link, the at

least one additional electrically conductive link
being within the aperture,

as required by amended claim 23 from which claims 8, 10-12, 15, 17-19 depend. As discussed above with regard to claim 23, Andrews fails to teach or suggest those limitations of amended claim 23. Gomez fails to compensate for the shortcomings of Andrews. Gomez teaches a multiple layer inductor including a spiral conductive pattern and conductive shield patterns. Abstract; Fig. 5; col. 5, lines 11-23. The conductive shield patterns of Gomez fail to teach or suggest that the plurality of electrically conductive links are electrically coupled to the electrically conductive enclosure and are electrically coupled to each other at a first location within the aperture, and that individual ones of the plurality of electrically conductive links are coupled to each other at least at a second location within the aperture by at least one additional electrically conductive link, the at least one additional electrically conductive link being within the aperture, as required by amended claim 23. Since Andrews and Gomez fail to teach or suggest the recited limitations and no other art of record adds the missing disclosure, Applicants respectfully request that the rejection of claims 8, 10-12, 15, 17-19 be withdrawn.

Regarding claim 13, Applicants respectfully maintain that Andrews, alone or in combination with Gomez or other references of record, fails to teach or suggest that

the top plate is formed in a redistribution layer,

as required by claim 13. Andrews teaches that “[l]ower and upper shielding layers 142 and 144 are comprised of a material having a high relative magnetic permeability.” Col. 3, lines 8-10. Nowhere does Andrews teach or suggest a redistribution layer, or that a top plate of an electrically conductive enclosure is formed in a redistribution layer, as required by claim 13. Gomez fails to compensate for the shortcomings of Andrews. Gomez teaches

multiple layer inductor 500 that advantageously enables smaller footprint implementations. Multiple layer inductor 500 is implemented on a substrate having a plurality of layers that each have a corresponding surface. As shown in FIG. 5, this multiple layer substrate has a first surface 530 that corresponds to a first layer 540, a second surface 532 that corresponds to a second layer 542, and a third surface 534 that corresponds to a third layer 544.

Col. 4, lines 44-52. Nowhere does Gomez teach or suggest a redistribution layer, or that a top plate of an electrically conductive enclosure is formed in a redistribution layer, as required by claim 13. Since Andrews and Gomez fail to teach or suggest the recited limitation and no other art of record adds the missing disclosure, Applicants respectfully request that the rejection of claim 13 be withdrawn.

Regarding claim 14, Applicants respectfully maintain that Andrews, alone or in combination with Gomez or other references of record, fails to teach or suggest

the top plate is formed in a package substrate,

as required by claim 14. Andrews teaches that “[l]ower and upper shielding layers 142 and 144 are comprised of a material having a high relative magnetic permeability.” Col. 3, lines 8-10. Nowhere does Andrews teach or suggest a top plate of an electrically conductive enclosure formed in a package substrate, as required by claim 14. Gomez fails to compensate for the shortcomings of Andrews. Gomez teaches

multiple layer inductor 500 that advantageously enables smaller footprint implementations. Multiple layer inductor 500 is implemented on a substrate having a plurality of layers that each have a corresponding surface. As shown in FIG. 5, this multiple layer substrate has a first surface 530 that corresponds to a first layer 540, a second surface 532 that corresponds to a second layer 542, and a third surface 534 that corresponds to a third layer 544.

Col. 4, lines 44-52. Nowhere does Gomez teach or suggest a top plate of an electrically conductive enclosure formed in a package substrate, as required by claim 14. Since Andrews and Gomez fail to teach or suggest the recited limitation and no other art of record adds the missing disclosure, Applicants respectfully request that the rejection of claim 14 be withdrawn.

Regarding claim 16, Applicants respectfully maintain that Andrews, alone or in combination with Gomez or other references of record, fails to teach or suggest

the inductor is formed at least partially in one or more redistribution layers formed on an integrated circuit die,

as required by claim 16. Andrews teaches that “[c]onduction path 140 comprises an aluminum, copper, or other standard metal conductor with a planar spiral shape and having inner and outer electrodes 152 and 154 for applying a current that flows along conduction path 140.” Col. 2, lines 49-52. Nowhere does Andrews teach or suggest a redistribution layer, or that the inductor is formed at least partially in one or more redistribution layers formed on an integrated circuit die, as required by claim 16. Gomez fails to compensate for the shortcomings of Andrews. Gomez teaches

multiple layer inductor 500 that advantageously enables smaller footprint implementations. Multiple layer inductor 500 is implemented on a substrate having a plurality of layers that each have a corresponding surface. As shown in FIG. 5, this multiple layer substrate has a first surface 530 that corresponds to a first layer 540, a second surface 532 that corresponds to a second layer 542, and a third surface 534 that corresponds to a third layer 544.

Col. 4, lines 44-52. Nowhere does Gomez teach or suggest a redistribution layer, or that the inductor is formed at least partially in one or more redistribution layers formed on an integrated circuit die, as required by claim 16. Since Andrews and Gomez fail to teach or suggest the recited limitation and no other art of record adds the missing disclosure, Applicants respectfully request that the rejection of claim 16 be withdrawn.

Additional Remarks

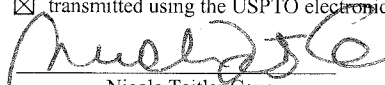
Claims 5-7 and 56 are amended to be consistent with amended claim 23.

New claim 58 is added further claiming the apparatus of claim 23 wherein,

individual ones of the plurality of electrically conductive links are coupled to at least one portion of the electrically conductive enclosure at a third location, the third location being at the perimeter of the aperture.


Applicants believe that Andrews, alone or in combination with Gomez or other references of record, fail to teach or suggest that limitation of new claim 58. Accordingly, Applicants respectfully request that new claim 58 be allowed.

In summary, all claims are believed to be allowable over the art of record, and a Notice of Allowance to that effect is respectfully solicited. Nonetheless, if any issues remain that could be more efficiently handled by telephone, the Examiner is requested to call the undersigned at the number listed below.

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Respectfully submitted,



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